SEEKING A PORT IN THE WMD STORM:

COUNTERPROLIFERATION PROGRESS, SHORTFALLS AND THE WAY AHEAD

by

Barry R. Schneider

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The Author

Dr. Barry R. Schneider is the director of the USAF Counterproliferation Center at Maxwell AFB, AL and a Professor of International Relations at the Air War College. Dr. Schneider specializes in NBC counterproliferation and nonproliferation issues. He is the author of *Future War and Counterproliferation: U.S. Military Responses to NBC Proliferation Threats* (Praeger, 1999) and contributor to and co-editor of *The War Next Time: Countering Rogue States and Terrorists Armed with Chemical and Biological Weapons*, (USAF Counterproliferation Center, 2003), *The Gathering Biological Warfare Storm.* (Westport, Connecticut: Praeger Publishers, 2004), *Know Thy Enemy: Profiles of Adversary Leaders and Their Strategic Cultures* (USAF Counterproliferation Center, 2002), *Middle East Security Issues: In the Shadow of Weapons of Mass Destruction Proliferation* (USAF Counterproliferation Center, 1999), *Pulling Back from the Nuclear Brink: Reducing and Countering Nuclear Threats* (Frank Cass Ltd., 1998), *Battlefield of the Future: 21st Century Warfare Issues* (Air University Press, 1998), *Missiles for the Nineties: ICBMs and Strategic Policy* (Westview, 1984), and *Current Issues in U.S. Defense Policy* (Praeger, 1976). He has served as a Foreign Affairs Officer and Public Affairs Officer at the U.S. Arms Control and Disarmament Agency, as a Congressional staffer on arms control and defense issues, and was a Senior Defense Analyst at The Harris Group and the National Institute for Public Policy. He has taught at the Air War College since 1993. As a faculty member, he teaches elective courses, which include International Rivals, International Flashpoints, Counterproliferation Issues, and CBW Issues for the USAF. He has taught at six other colleges and universities, and has a Ph.D. in Political Science from Columbia University.

Seeking a Port in the WMD Storm:

Counterproliferation Progress, Shortfalls and the Way Ahead

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I. Introduction

Like a ship running from a hurricane at sea, the United States Government is struggling to reach a safe port and shelter from a threatening WMD storm. In an era where some adversaries are perhaps on the cusp of achieving the capabilities to destroy forward deployed American military forces with nuclear weapons (e.g., in a future conflict with North Korea) or to kill thousands of Americans in our cities with aerosolized biological weapons (e.g., if Al Qaeda were to achieve the capability), the United States and its allies are racing to create effective chemical, biological, radiological, and nuclear (CBRN) countermeasures. Serious gaps remain, however, and extreme vulnerabilities persist even a decade after Secretary Les Aspin announced the beginning of the Department of Defense (DoD) Counterproliferation Initiative (CPI).

Much has been done since the CPI was launched in 1993, but much still must be accomplished before the United States can confidently either deter all adversaries from CBRN attacks or, at least, effectively neutralize any such attacks by a combination of effective counterforce targeting, active defenses, passive defenses, or the ability to recover through superb consequence management actions.

The Ideal Counterproliferation Posture

Much progress has been made in the decade since Secretary Aspin and his deputy, Dr. Ashton Carter, launched the DoD Counterproliferation Initiative. However, progress to date does not equate to success. Many additional steps must be taken before the United States and its allies can claim reasonable levels of preparedness in the effort to halt, thin out,

manage, rollback, or counter the weapons of mass destruction threats posed by adversary states and groups.

To evaluate the ideal and compare it to the present counterproliferation program, and identify the progress and shortfalls of the counterproliferation program, it is useful to look at the various elements where the Department of Defense is the lead agency before offering an overall assessment.

II. Deterrence

Maximum Deterrence Stance

The ideal deterrence posture can only be arrived at if the United States and its partners possess a known retaliatory military and economic capability that can impose costs on an aggressor state that are unacceptably high to its leadership should they elect to attack us. Further, that adversary leadership must believe the United States and its allies will have the will to use such full retaliatory strikes if provoked. Third, this U.S./allied retaliatory force must be able to survive an enemy surprise attack before delivering its response. Fourth, deterrence is most likely to work when the adversary leadership is rational and fully understands the self-defeating nature of starting a conflict and does not believe it can secure a compromise place down the road that would allow them to keep any initial gain made by striking first. Fifth, U.S. allied counterforce, active defense, passive defense, and consequence management capabilities would be so robust in an ideal counterproliferation posture that an adversary chemical, biological, radiological, and nuclear (CBRN) attack would be neutralized and U.S./allied forces would be better equipped to fight in such a toxic environment than the aggressor forces. Knowing that his CBRN weapons could be neutralized, a rational adversary is likely to be deterred from use of unconventional arms.

Last, but not by any means least, an ideal robust U.S. and allied deterrent would be based on a thorough knowledge of the enemy, both his leadership and order of battle. The full intelligence preparation of the battlespace would include political-psychological profiles of enemy leader tendencies and values as well as a full understanding of adversary force characteristics and numbers as well as where their key assets are located. For full deterrent effects, the adversary should be made to understand that U.S. forces can effectively put bombs on key targets of greatest value to the adversary leaders.

Deterrence can be improved if you know the capabilities and mind of your adversary. U.S. intelligence services should seek to learn the CBRN capabilities, locations, and intent of possible adversaries. The recent experience in Iraq indicates a shortfall in U.S. and allied intelligence about Saddam Hussein's nuclear, chemical, and biological weapons potential.

The United States Government appears to have drastically overestimated the Iraqi weapons of mass destruction threat as a result of depending upon unreliable defector information, relying on inconclusive findings from national technical means, and lacking adequate human intelligence inside Saddam Hussein’s regime.

Plausibly, U.S. intelligence concluded from Iraq’s inability to document disarmament of its weapons of mass destruction programs, its unwillingness to cooperate with United Nations inspection teams, and the heavy economic costs of non-compliance, that Iraq was hiding a significant weapons of mass destruction arsenal and infrastructure. Saddam Hussein’s regime is estimated to have lost $100 billion or more due to sanctions that limited Iraqi oil sales until the United Nations inspectors could verify that Iraq had truly scrapped its weapons of mass destruction assets. Further, Saddam Hussein, before his defeat in Operation Desert Storm, had invested heavily in his nuclear, chemical, and biological warfare programs and the tyrant was still in place in early 2003 when Operation Iraqi Freedom was launched into Iraq to disarm his regime.

Many questions remain as to the disposition of Iraqi CBRN weapons:

1. Were these weapons programs discontinued to avoid further United Nations sanctions?
2. Were they hidden somewhere inside or outside Iraq to be claimed at a later date?
3. Were the Iraqi weapons of mass destruction hardware programs discontinued while “software” analytic efforts to perfect such weapons continued?
4. Was Saddam Hussein too proud to cooperate with the United Nations inspectors and/or afraid to look so weak as to admit disarming?
5. Did Saddam Hussein disarm privately but pretend to retain weapons of mass destruction in order to deter enemies like Iran and the United States from intervention into Iraq?

6. Did Iraqi scientists lie to Saddam Hussein about the extent of their WMD research and production, thereby making it impossible to find weapons never actually produced in quantity after 1991?

We may never know the full story about the Iraqi weapons of mass destruction program. What is clear to the U.S. Select Committee on Intelligence, however, is that U.S. intelligence about the program was far off the mark[1] and largely in the dark, leading analysts to draw speculative conclusions that were wrong because they were grounded in too many uncertainties and because their plausible theory, nevertheless, appears to have turned out to be incorrect.

This has led critics of U.S. intelligence to suggest that analysis of adversary weapons of mass destruction be more careful and rigorous, be increasingly reliant on human intelligence, be dependent on known hard facts, and that interpretations be challenged more by intelligence superiors as well as by decision-makers. Furthermore, such analyses should be mated with a more intense scrutiny of the intent of adversary leaders and the factors that shape their decisions.

With regard to the last point, U.S. deterrence capability versus enemies' war initiation or use of weapons of mass destruction should rest on a clear understanding of the thinking of adversary leaders to enable U.S. leaders to pose retaliatory threats that such adversaries will most fear and best understand.

Profiling of potential adversary leaders, done by intelligence experts dedicated to understanding their goals, decision-making processes, tendencies, personalities, and vulnerabilities can yield useful deterrence results if combined with a very potent U.S. retaliatory capability, an obvious will to respond to attacks, and a clearly crafted communication of both U.S. military muscle and U.S. determination to exact retribution for any losses suffered by U.S. citizens. In the end, adversaries must be taught to fear the American retribution and to conclude that aggression against the United States is a fool's gamble, a path that could only lead them to a terrible end.

Unfortunately, U.S. intelligence services have placed less importance on profiling of enemy leaders in the post-Cold War era than they did when we were threatened by the Soviet Union in the period from 1946 to 1991. These profiling capabilities, if resurrected and heeded, may give us better

insights into how to deter, compel, counter, and anticipate the actions ordered by leaders of rogue states and terrorist adversaries.

It is suggested that both the Defense Intelligence Agency (DIA) and the CIA resurrect such dedicated interdisciplinary profiling groups that can study and help U.S. leaders understand the political/psychological dimensions of adversary leaders, their strategic cultures, military doctrines, and organizational decision-processes to determine likely adversary courses of action and tendencies in projected scenarios. A good model to follow would be the Center for the Analysis of Personality and Political Behavior directed by Dr. Jerrold Post at the CIA for a number of years that did profiles of foreign leaders to inform and assist U.S. policy-makers who dealt with them.[2] Unfortunately, this center was dissolved and never adequately replaced after the late 1980s.

Such profiling could help U.S. leaders better understand who they are contending with, the things enemies most value and would least like to lose, and the actions that would most likely elicit either more cooperation or more violent responses. Such analysis of adversary leaders might help U.S. leaders better sort out enemy bluffs from real threats and might guide U.S. actions that could help persuade an adversary not to initiate a conflict nor escalate it to weapons of mass destruction use once embroiled.

In addition, it will be important for the U.S. intelligence services to greatly expand their expertise in the Middle East and northeast Asia particularly. More analysts need to be trained in the Korean, Chinese, Arabic, and Farsi languages, and much more emphasis needs to be given to creating human intelligence on the ground in countries in the conflict zones. HUMINT is in scare supply and it is difficult to “know thy enemy” without it.

III. Counterforce

Maximum Counterforce Capability

The ideal counterforce posture will combine a comprehensive precision-guided munition arsenal of weapons, acquired in such numbers that most known key fixed surface targets in the adversary state can be eliminated. In addition, all airborne attack assets should be on stealthy launch platforms that cannot be readily detected by the radars of enemy surface-to-air missiles and other anti-aircraft batteries.

This counterforce capability against fixed surface targets must also be coupled with additional capabilities to locate and destroy both mobile CBRN missile launchers and CBRN assets located in deeply buried facilities, hidden in tunnels bored into hillsides or concealed in cut-and-cover hardened shelters. The ideal counterforce capability will have the use of robust earth penetrators and have the information and capabilities needed to inflict functional defeats on the hardened underground target sets when absolute destruction is not possible.

The ideal counterforce capability also will be augmented by a comprehensive and accurate intelligence preparation of the battlespace. Ideally, all CBRN targets of consequence must be identified, characterized, and located. Then, optimally, after such locations and assets are struck, accurate damage assessments must be capable of being made in order to restrike undamaged CBRN assets, and this process should, within a short time, be able to silence such adversary CBRN weapons.

Ideal counterforce capabilities would be robust enough to tackle the entire range of enemy CBRN assets before a significant number could be employed against U.S. and allied targets. This suggests the need for a persistent overhead shooter and sensor capability, augmented by heavy Special Operations Forces incursions on the ground, to slam the door shut on enemy CBRN usage before it could inflict heavy damage. Such an ideal force also will require a 24/7/365 overhead persistent intelligence, surveillance, and reconnaissance (ISR) presence to provide targeting information to shooters until the threat is eliminated.

Finally, the maximum or ideal counterforce capability will require adequate stocks of effective agent defeat weapons to destroy, neutralize, or

entomb adversary chemical, biological, radiological, or nuclear weapons assets without significant spillover danger to adjacent civilians or friendly forces.

Progress and Shortfalls in Counterforce

The advent of precision-guided munitions has greatly improved the accuracy, and therefore, the lethality of U.S. weapons against fixed targets identified on the earth's surface from the time of Operation Desert Storm on. This precision-guided munition revolution has resulted in a dramatic change in the ratio of weapons employed to targets destroyed. Whereas, in pre-1991 wars, air campaign outcomes were described in terms of hundreds or thousands of sorties per target destroyed, in the present era we can now talk of numbers of targets destroyed per sortie.

The introduction of stealthy aircraft also has made the counterforce mission easier and less costly in terms of aviators and aircraft lost on these missions since air defenses have been almost helpless against such hard-to-locate attackers. Stealthy aircraft can not only penetrate to target but can also attack targets at closer range at less risk than if conventional aircraft were used, increasing the chances of successful engagements.

So long as U.S. intelligence can provide exact coordinates for surface targets, U.S. strike aircraft can destroy them with great effectiveness. There, of course, is the rub. Certain high value, time-sensitive targets, such as ballistic missiles with CBRN warheads about to be launched from hidden or camouflaged mobile launchers or those at fixed sites, may be invisible to United States intelligence, surveillance, and reconnaissance assets. It is difficult to destroy targets whose precise whereabouts are uncertain, so counterforce effectiveness against surface targets is dependent on accurate target location information.

Because of the increasing vulnerability of fixed-location assets on the ground, U.S. adversaries have begun placing their command and control centers, missile launchers, and weapons of mass destruction assets either in underground hardened sites, inside tunnels bored into the sides of hills or mountains, or have made them mobile by deploying them on wheeled vehicles or trains. Thus, counterforce attacks may be complicated by an enemy's mole or mobility tactics. North Korea, for example, has hidden most of its missile launchers and artillery in tunnels bored into the sides of

mountains north of the Demilitarized Zone. Iraq, during the 1990-1991 Gulf War, launched 88 ballistic missiles toward Coalition forces and Israel and the U.S. "Scud Hunt" for these mobile assets was deemed almost totally unsuccessful. Despite allocating approximately 1,500 sorties against such targets in the war, there was not a single confirmed kill against Scud transporter-erector-launchers.

Defeating some of the deeply buried hardened targets through outright physical destruction of the facilities may be outside the capabilities of today's forces. Short of nuclear weapons use, many underground hardened sites cannot be eliminated, and some are so deeply buried that even a nuclear detonation may not suffice. Added to these problems is the fact that nuclear use likely would have so much of a political downside that U.S. decision-makers probably would be unwilling to open Pandora's Box by employing such precedent-setting weapons and by risking incurring worldwide disfavor, condemnation, and the sanctions that probably would follow.

Perhaps the best and most likely strategy to defeat underground targets is to first locate them and then inflict a functional defeat by denying that facility electrical power, air, heat, connectivity, food, water, ingress or egress, and other essentials. This places an extraordinary burden upon the U.S. intelligence preparation of the battlespace in order to locate the wiring, vents, entrances, exits, antennas, and emissions of each such underground facility.

It is difficult to evaluate how much the United States has progressed in its ability to achieve functional defeats on underground targets since it has had little wartime experience since 1991 against such targets. However, clearly there has been a degree of progress in fielding ISR assets needed to do the thorough intelligence assessments necessary to this difficult mission. The addition of Predator and Global Hawk Unmanned Aerial Vehicles (UAVs) gives the military a somewhat more continuous overhead view of such installations, combined with Special Operations Forces (SOF) improvements and the still imperfect development of unattended ground sensors.

Still missing is a suite of weapons capable of destroying deeply buried hardened targets, the lack of enough persistent overhead intelligence, surveillance and reconnaissance assets, and the limited numbers of "shooters" that can be kept close to the targets 24/7. Further,

only a limited agent defeat weapon capability exists. Therefore, the balance of advantage over the past decade has to be given to adversary defenses over U.S. counterforce offenses. Should the United States field a nuclear earth-penetrating weapon it would bring a number of additional high value targets within reach that are currently not threatened, although a certain number of such deeply buried facilities would still remain relatively safe from being destroyed. Employing such a nuclear device, however, would likely create diplomatic and political problems that could be seen to outweigh its counterforce advantages.

The U.S. capability to track, target, destroy, and assess damage against mobile missile launches is probably improved a good deal from Operation Desert Storm in 1991 to Operation Iraqi Freedom (OIF) in 2003. Exercises prior to OIF at Nellis Air Force Base, Nevada, led to greater coordination between Special Forces, strike aircraft, and ISR assets and probably would have narrowed the advantages still enjoyed by adversaries in "the Scud Hunt." There have been considerable Scud Hunting improvements in ISR due to deployment of Global Hawk and Predator UAVs, as well as command and control improvement due to the professionalization, reorganization, and information processing changes in the Combined Air Operations Center.

However, having said all this, U.S. persistent overhead ISR is still lacking over the battlespace and many of the information processing, battle management, and automatic target recognition technologies are still in research and development rather than deployed, as many should have been thirteen years after the Scud Hunt failures of 1991. The continued inability to solve the critical mobile missile problem is an unfortunate failure. Unfortunately, no single organization or agency has been appointed or chosen to step forward to solve this pressing military problem. Hopefully, it will not require a military catastrophe to get proper attention to this problem. It would be very unfortunate if the gravity of this error was only realized after an adversary kills tens of thousands of U.S. or allied personnel when launching a missile carrying a weapon of mass destruction warhead from a transporter-erector-launcher that otherwise could have been neutralized.

The "Scud Hunt" program needs leadership attention, more persistent overhead intelligence, surveillance, and reconnaissance assets, more shooters and sensors constantly in the target area, and new technology that

assists in more rapidly processing battle management information and target tracking, to reduce the sensor-to-shooter time to just a few minutes. First, and foremost, someone in the Department of Defense has to own the problem, be responsible for progress, and wield enough influence to bring the multiple research and development solutions now available to the field, where U.S. combatant commanders can wield them in the next war.

Not only should someone be put in charge of coordinating all the cross-functional elements of "Scud Hunting," but someone else at the highest levels of the Department of Defense must oversee the progress of the program, ensure proper funding, and hold the commanders and managers accountable for outcomes. Combatant commanders must demand that their forces be properly organized, trained, and equipped to carry out this mission in the future. Additional Congressional oversight and Presidential level attention might be needed to direct proper attention to this program.

The issue of preemption has become a controversial topic for policy debate. One component of this debate is the question of when such action is appropriate, legal, and necessary for security. Given the extreme level of damage that could be done by, say, a nuclear or strategic biological weapons attack, it is prudent to destroy those types of threats before they are inflicted upon one's own forces or population, if the attack appears to be imminent and intelligence is such that reasonable certainty of use can be confirmed.

As one recent study by the Center for Counterproliferation Research at the National Defense University states with regard to the need for a capability for rapid precision strikes:

> "Because the time window for engaging many WMD counterforce targets may be narrow, there will be a premium in these missions on what has come to be called "network-centric operations" – the effective integration of intelligence, surveillance, and reconnaissance (ISR), rapid adaptive planning, collaborative decision-making, strike coordination, and real-time battle damage assessment. The need in some cases for prompt strikes highlights a potential shortfall in current capability. Prompt conventional global strike is a potentially high-value deterrent and combat capability against a range of target types. That is, the

> ability to deliver decisive effects rapidly may be key to denying adversaries the time to exercise asymmetric strategies, holding strategic assets at risk before effective sanctuary is achieved, and restoring deterrence through rapid, shock-maximizing strikes. In particular, there is advantage for U.S. forces if time-sensitive targets can be held at risk at all times – including when theater-based assets are not available."[3]

IV. Active Defenses

Maximum Active Defenses

The ideal active defense force will be robust enough so that it can reduce enemy missile and aircraft attacks to a minimum by intercepting, destroying, or deflecting them before their CBRN warheads and bombs can reach their targets. Such an ideal system will have very high performance SATKA capabilities for **s**urveillance of incoming attackers, **a**cquisition of the targets, **t**racking of the targets, **k**illing of the attacking missiles or aircraft, and **a**ssessing the results to determine whether to go into a re-attack mode.

The likely ideal missile defense will probably feature a layered defense with accurate and effective missile interceptors operating in the boost phase, post-boost phase, mid-course range, and terminal phases of an adversary missile's flight. A three-layer or four-layer defense, with each phase providing a 90 percent kill probability in its engagements, if deployed in adequate interceptor numbers, should be able to sweep the skies of adversary aircraft or missiles.

This ideal active defense system could also be provided by a multi-shot speed-of-light system such as the boost-phase airborne laser (ABL) now in development, if it is proven feasible, is procured in adequate numbers, is continuously deployed, and has a high probability of kill (PK) per shot.

The ideal active defense capability will also defend comprehensively against the 360 degree azimuth threat of low flying, relatively inexpensive cruise missiles, possibly launched in swarms. The ideal defense against cruise missiles will probably deploy airborne look-down radars to discern low-flying cruise missiles from the surrounding ground clutter and will be augmented by airborne and ground-based interceptors that can be directed to a full 360 degree layered or multi-shot defense. An ideal active defense would be robust enough to intercept, simultaneously, even a saturation attack by dozens of cruise missiles.

The Progress and Shortfalls in Active Defenses

One means of delivering CBRN weapons is by ballistic or cruise missiles and, as of this writing, both present very difficult challenges to U.S. active defenses. The difficulty of the theater ballistic missile (TBM) defensive task is akin to developing a bullet to hit an incoming bullet. Nuclear and biological munitions mounted on missiles will increasingly pose a strategic threat to U.S. and allied forces and citizens in the next two decades. The list of states with such missiles is growing. For example, it has been estimated that 75 states have some form of cruise missiles and that there are roughly 75,000 cruise missiles held by these countries. Compared to nuclear and biological weapons, chemical arms pose no strategic threat unless, for example, many tons of chemical agents are delivered, an unlikely threat. Radiological weapons are strictly tactical, but could be useful to the user in rendering certain limited areas unusable or, at least dangerous, to operate within.

U.S. ballistic missile defense programs have made important improvements since 1993. The Patriot-2 (PAC-2) theater ballistic missile terminal defense system was introduced in the 1991 Gulf War where it enjoyed some limited success against Iraqi ballistic missile attacks. The PAC-2 has now been superseded by the more accurate Patriot-3, which introduces new hit-to-kill technology and has a wider range of coverage. Basically, however, United States forces will not be very well defended against theater ballistic missiles until the next generation of defense upgrades which will provide a layered defense.

Now in development are no fewer than five other U.S. theater missile defense systems: the Terminal High Altitude Area Defense (THAAD), the Medium Extended Air Defense System (MEADS), the mid-course interceptor Navy Theater-Wide Ballistic Missile Defense system, lower-tier Navy Area Theater Ballistic Missile Defense System, and the Airborne Laser (ABL). When all or most are fielded, if they work as advertised, and are deployed in sufficient numbers, the United States and its allies will possess for the first time a viable ballistic missile defense against enemies who possess several hundred of such missiles. This will be a breakthrough since no nation state has had a viable missile defense since WWII when these types of weapons were introduced into combat by

the Germans when they barraged Great Britain with their V-1 and V-2 missiles.

The goal in ballistic missile defense is to achieve a multi-layered or multi-shot defense where each layer or shot has, let us say, a 90 percent or higher kill probability against the incoming missiles. Indeed, it may be possible to intercept such enemy systems multiple times when using the Airborne Laser, which is expected to be capable of up to 30 speed-of-light shots or intercepts. One can imagine a three layer defense made up of the Airborne Laser to intercept missiles in their boost and post-boost phases of flight, augmented by the Army's Terminal High Altitude Area Defense and Navy Area Theater Ballistic Missile Defenses for kinetic kills at mid-course ranges, and PAC-3, Medium Extended Air Defense System, and Navy lower-tier interceptors to rise to meet whatever enemy missiles got through the first two layers of defense.

Therefore, if a country such as North Korea were to become engaged in combat with U.S. and Republic of Korea forces in the South and fired off a hundred ballistic missiles at Republic of Korea targets, a two-layer (mid-course and terminal interceptor) defense with a 90 percent probability of kill per layer would permit just one leaker to reach its targets. In this case, 90 of the 100 missiles could be eliminated by mid-course interceptors like Terminal High Altitude Area Defense and Aegis Wide Area interceptors. Then, 9 of the remaining 10 missiles might be eliminated by terminal defenses like the Patriot-3 or the Aegis Navy terminal interceptors. Unfortunately, at present only limited numbers of Patriot-3s are defending these areas where adversary states might possibly one day take action.

Several international partners are also working on theater ballistic missile defensive systems. Lockheed-Martin has collaborated with Israel in its development of the Arrow interceptors now being deployed. In addition, the United States is in the early stages of collaborating with Japan to develop a ballistic missile defense system. And, finally, the NATO allies are collaborating to finance the Medium Extended Air Defense System, a mobile terminal "bubbletop" defense for shielding land forces as they move into or across theater. The Medium Extended Range Air Defense System, for example, could be an excellent terminal defense for an invasion force being landed at ports or being sent across a beach under hostile fire. It is designed to provide the protective bubble over a power projection force being sent into a foreign theater to "kick the doors

down" for follow-on reinforcements. Until theater active defenses are augmented with such robust multi-layered, multi-shot interceptors, U.S. forces will be largely at the mercy of enemy ballistic missile attacks.

Adding to this emerging U.S. theater ballistic missile defensive capability will be a new U.S. strategic terminal defensive system to defend the continental United States. Twenty interceptors based in Alaska and California will provide the possibility of a defense against a light enemy missile strike. The beginnings of such a system, no longer restricted by the Anti-Ballistic Missile Treaty, designed initially to be capable of defending against a light ballistic missile attack, was scheduled to be in place and operating by late 2004. Thus, United States territory will be defended against a handful of missiles launched against targets on the West Coast of the United States from potential adversary states such as North Korea or China. It might also be used to intercept stray accidental launches of long-range ballistic missiles that headed toward U.S. territory. Missile defense programs, both theater and strategic, cost $10 billion in FY 2004, and consume the large majority of Department of Defense funding for counterproliferation capabilities.

Perhaps most disturbing in the area of active defenses is the lack of progress in U.S. cruise missile defenses at a time when foreign cruise missile capabilities have spread to over seventy-five countries.[4] The leadership of the Missile Defense Agency has focused its work almost exclusively upon defeating the ballistic missile threat, to the neglect of cruise missile defense.

This neglect of cruise missile defense is compounded by the fact that, from an adversary perspective, these are perhaps the ideal adversary weapons to carry biological munitions. Adversary leaders of a relatively poor state might pursue an asymmetrical strategy of coupling the poor nation's best strategic delivery system, cruise missiles, with the poor nation's best weapon of mass destruction, biological weapons, in order to level the playing field against the world's military superpower. Cruise missiles are much cheaper to build or buy than ballistic missiles. They have tiny radar cross-sections and fly close to the nap of the earth where they can be lost in the earth's ground clutter, making them difficult to detect, track, and target. Because they are relatively cheap they can be produced and fired in numbers sufficient to saturate even very good air defenses. Further, they can pose a 360 degree threat since they can be

programmed to fly pre-designated routes and change directions as programmed. Finally, their speed is relatively slow so that they can more easily distribute aerosolized biological warfare agents on targets below them, as opposed to supersonic ballistic missiles that can be less easily programmed for optimal height of bursts and have problems of heat shielding which, if not perfect, could burn up the biological munitions being delivered.

Thus, a possibly fatal flaw in U.S. active defenses is the neglect of cruise missiles defense during the past decade, and the failure of the U.S. Missile Defense Agency or the Joint Theater Air and Missile Defense Organization (JTAMDO) to focus on this problem satisfactorily.

Of course, active defenses also need to be conducted on the ground along places like the demilitarized zone (DMZ) separating the two Koreas, along the U.S. and allied borders and around U.S. military facilities in the continental United States or worldwide. Enemy Special Forces and terrorists could utilize CBRN weapons in various ways without utilizing missile systems, witness the possibilities of using crop duster aircraft to distribute biological agents over targeted areas or saboteurs to detonate explosives where toxic industrial chemicals (TICs) and toxic industrial materials (TIMs) are manufactured and stored. Every American and allied city and port has such targets and guarding against all other types of CBRN attacks is an unenviable active defense job where the odds favor the attackers who can pick the time and place.

V. Passive Defense

Maximum Passive Defenses

The ideal passive defensive system will provide redundant and highly effective biological, chemical, and radiological weapons detectors, light-weight biological warfare masks, and full counter-chemical warfare and counter-biological warfare individual protective equipment (IPE) complete with masks, boots, gloves, and overgarments to each U.S. and allied military person, and associated civilian support workers.[5] Indeed, each individual should possess multiple backup protective suits, masks, gloves, and boots so that they can change out of contaminated gear to gain continuous protection over the period of the conflict. The ideal passive defenses will also have administered the full range of biological warfare vaccines and chemical warfare antidotes to the U.S. and allied force and support workers and will have ready access to prepositioned counter-biological warfare and counter-chemical warfare medicines, protective equipment, and decontaminants such as are stockpiled in the continental United States in the Strategic National Stockpile (SNS).

Also, the ideal passive defense program will provide effective collective protection shelters for all base personnel and will stockpile adequate medical supplies and equipment to cope with CBRN emergencies. Further, this program will provide plans, training, and adequate resources for dealing with the medical side of a CBRN conflict, including well-thought-out plans for handling evacuations, mass casualties (triage, evacuations, quarantines), and identification of the physically injured and separation from the "worried well" to prevent the overwhelming of medical staffs and supplies.

The ideal passive defense program will provide both a point detector and a stand-off sensor system that detects biological and chemical agents in incoming weapons or in aerosolized clouds approaching U.S. and allied positions. This ideal detect-to-warn sensor alarm will provide enough warning time for friendly forces to don masks and take shelter before the attack arrives, thus substituting for the "detect to treat" system now in place.

In addition to the need for excellent point and stand-off detectors to sense when a CBRN attack is taking place, and decontamination and medical diagnostic capabilities to sustain the force when it is subject to

such enemy weapons, the ideal passive defense system also needs technologies to shield the force, including individual and collective protective equipment and chemical, biological, or radiological prophylaxes. Finally, the ideal passive defense must be designed and run by those who understand the threat environment by providing to the warfighter the optimal battle analysis, battle management tools based on modeling and simulation training. The ideal passive defense will take advantage of an integrated early warning system, an advanced medical surveillance system, and concepts of operation designed to both protect the force and its ability to execute the mission (e.g., the USAF Counter-CW CONOPS).

Progress and Shortfalls in Passive Defense

Significant progress has been made in passive defenses over the first decade since the start of the Defense Counterproliferation Initiative in 1993. Indeed, in no element of U.S. counterproliferation policy has more progress been made than in passive defense, and that is true despite the fact that the active defense investment is ten times that of passive defense, with far less satisfactory results. This leads some to question the priorities of the overall CP program.

When Secretary Aspin launched the CPI, only a small percentage of the armed forces personnel had been administered anthrax vaccine. Today, most personnel going into harm's way have been inoculated against this primary BW threat, although in late 2004 the anthrax vaccinations were halted by court order, subject to further safety testing of the vaccine. As of this writing in 2005, the DoD is appealing this ruling in order to restart the program.

In 1993, those military units that had protective masks, overgarments, gloves, and boots to guard against chemical attacks had only the very bulky, very hot, very restrictive protective gear. Today, much of the active duty U.S. military assigned to forward bases in danger zones like Iraq, South Korea, and Afghanistan have at the ready much lighter, less restrictive, and less oppressive new Joint Service Lightweight Integrated Suit Technology (JSLIST) overgarments.

In addition, the force has been given improved protective masks like the M20 and M42. These replace the M17, M25, and M9 and feature a

better face seal, increased useful life, weather and ozone resistance, improved comfort and ease of cleaning and maintenance. Also, the new M25 mask supports the Army and special operations forces personnel and gives them close-fitting eye lenses, a voice-emitter for face-to-face and telephone communication, a drinking tube, and an interphone for aircraft communications. Three other new improved masks are now in R&D for deployment in the next several years for helicopter pilots, and selected ground forces and commercial applications.

Further, inspections of U.S. bases abroad in the early to mid-1990s showed that collective protection (COLPRO) shelters had long been neglected and were inadequate to meet the chemical and biological warfare threats anticipated in the future. Some progress, although not nearly enough, has been made to improve the collective protection capabilities at key bases like Osan Air Base in the Republic of Korea and others within close reach of adversaries. Other U.S. bases generally are far less prepared to offer up-to-date, fully equipped and supplied, toxic-free shelters.

In FY 2001, the United States military began deploying a 300 square foot Chemical Biological Protective Shelter (CBPS) to replace the older M51 shelters. These CBPS units will help provide relief to personnel who can use such contamination-free zones to rest, get treatment, gain relief from protective overgarments, take care of bodily functions, and get into fresh protective gear.

Other new collective protection shelters used to improve medical service to combatants are the U.S. Army Chemical Protected Deployable Medical System (CP DEPMEDS) and the U.S. Air Force Chemically Hardened Air Transportable Hospital (CHATH) which were both introduced to the field in FY 2001 to provide a toxic free treatment area.

U.S. Navy ships are also being backfitted to accept a Collective Protection System (CPS) to provide a contamination-free environment in designated locations aboard each vessel. These were designed to protect mission-essential and life-sustaining functions on board while the naval vessel and its crew are subject to chemical and/or biological attacks. This backfitting program began in FY 2001 and will proceed for many years as the United States moves to protect its fleet and personnel.

In addition, the Department of Defense also is working on the Joint Collective Protection Equipment (JCPE) program to provide improved

filters to prevent the flow of chemical and biological particulates into collective protection shelters.

Finally, still in research and development is the Joint Transportable Collective Protection System (JTCOPS), a modular shelter system that can, when deployed, be used as a stand-alone structure or as a toxic-free shelter within existing structures to protect against chemical and biological agents, toxic industrial materials, and radiological particulate matter.[6]

Medical preparations for CBRN warfare have led to some very useful new passive defense programs in the decade since the Counterproliferation Initiative was begun. One such advance is the introduction of the Global Expeditionary Medical System (GEMS), previously known as Desert Cove.[7]

The Global Expeditionary Medical System allows for integration of patient evaluation, epidemiological analysis, and command and control linkages of medics at the scene of casualties to commanders in the rear. The Global Expeditionary Medical System uses the Rugged Advanced Pathogen Identification Device (RAPID) to tell medical personnel and commanders in real time what kind of biological warfare agent is being used by the enemy force. This RAPID assessment facilitates command decisions such as what kinds of treatment to administer, whether to isolate casualties, and whether or not to quarantine personnel or sectors. Another GEMS tool is the Patient Encounter Module, a paperless data linked tool for the front line medic to record and trade individual patient assessments. The Global Expeditionary Medical System also utilizes the Theater Epidemiological Module, an analysis tool designed for far forward use as well as a capable reporting system to aid command and control surveillance of the battle area. Finally, the Global Expeditionary Medical System personnel also use the Theater Occupational Module which assists the user in estimating the level of biological warfare contamination risk in a given area by comparing and contrasting readings with a baseline normal operating environment.

In the past decade, the military medical community has given more attention to the medical risks of different types of biological agents and the intelligence assessments of what different adversary states and groups are thought to possess. For example, they have concluded that for a group of rogue states the medical risks and intelligence assessment of possible possession is greatest for agents like anthrax, botulinum toxin, plague, and ricin. The possibility of biological warfare agents like smallpox, encephalitis, and Ebola being in the hands of adversaries is not

as likely, but should they use such weapons the results could be as or more severe than the first four cited.[8] (See Figure 1.)

Figure 1. Biodefense: Certain Weapons Pose Critical Risk[9]

Intelligence Threat (HAZARD PROBABILITY)

GREATEST ← LEAST

Medical Risk: LEAST → GREATEST

Catastrophic	None	None	Ebola	None
Critical	Anthrax Bot.Toxin Plague Ricin	Smallpox Encephalitis	None	None
Marginal	None	Tularemia SEB (Staph. Enterotoxin)	Glanders	Mycotoxins (Tricothecene)
Negligible	None	Enceph. virus (VEE)	Q-Fever Cholera	Brucellosis Typhus

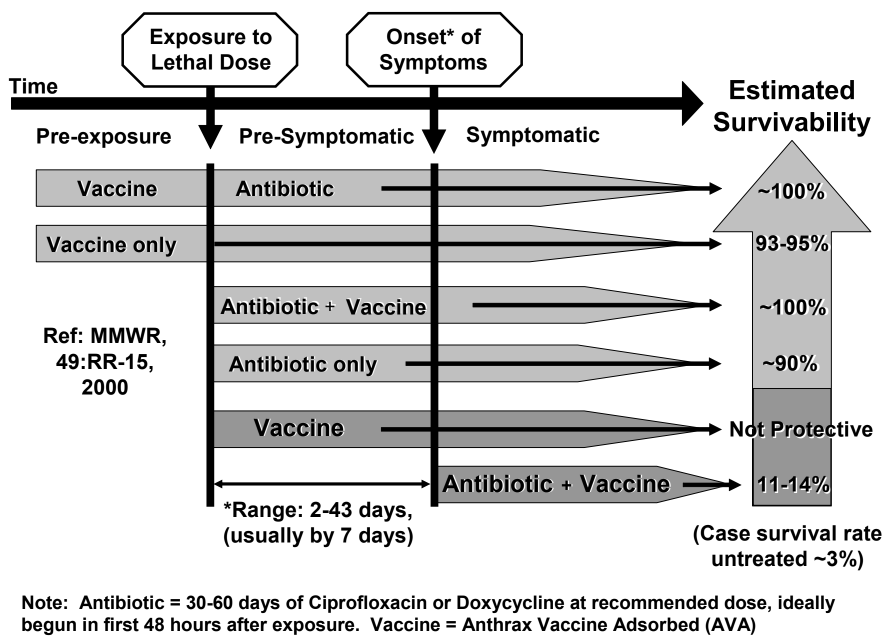
High Risk and Threat Agents have the potential to severely degrade Air Operations – Vaccines can manage some risk

Medical countermeasures have now been developed to decrease the risk to personnel associated with enemy biological warfare attacks and to continue to carry out U.S. military missions. One such product, new to the inventory in the 1990s, is Pentavalent Botulinium Toxoid (PBT) to treat Botulinium Toxin (BOT). Unfortunately, there is no present manufacturer to produce PBT in the quantities needed. The U.S. military medical community works to keep food and water safe, provides a number of relevant vaccines like the Anthrax Vaccine Adsorbed (AVA), uses systems like the Global Expeditionary Medical System to detect and identify biological agents rapidly, and utilizes protective equipment to protect personnel and field hospitals. If these pre-exposure measures do not prevent infections, the medical community still utilizes vaccines, antibodies, antivirals, protective equipment, decontamination, disease surveillance techniques, and other treatments to aid casualties and prevent the spreading of contagious diseases.

Still under study is how to treat massive numbers of casualties, what roles the civilian sector can play in such treatment, how to triage a mass casualty event, when to quarantine casualties and exposed personnel, where and when to execute an evacuation of personnel, and how to dovetail the medical response with ongoing combat operations. Also, unresolved is how much forward-deployed stockpiles of medical equipment, vaccines, and medical supplies are required in different Combatant Command areas of responsibility to cope with possible biological warfare attacks.

Recent analysis of what many consider the number one biological warfare threat, anthrax, shows some interesting data on survivability of personnel given the timing and medical countermeasures taken. (See Figure 2.)

Figure 2. Medical Countermeasures and Survivability Example: Anthrax[10]

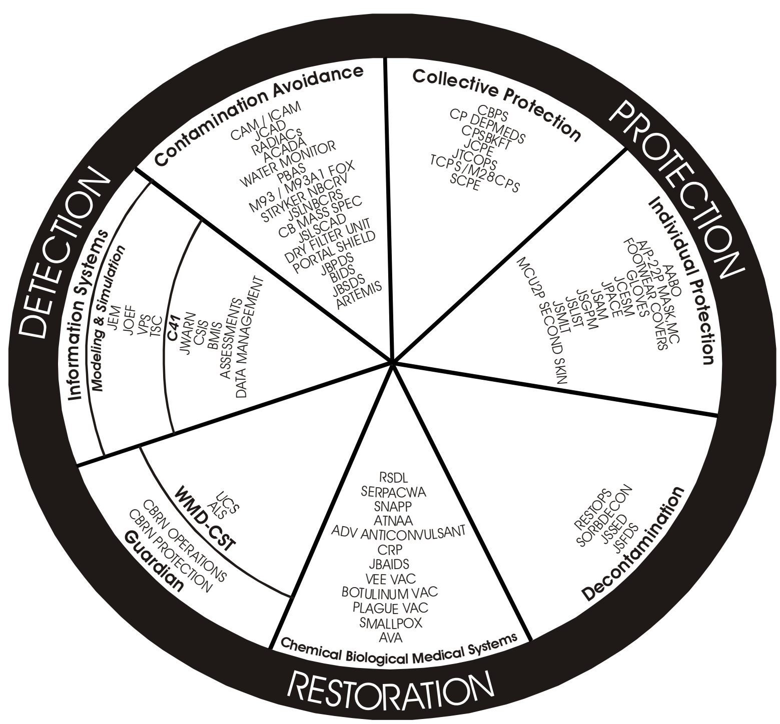


Note the importance of administering Anthrax Vaccine Adsorbed either during the pre-exposure or pre-symptomatic phases of an anthrax attack on personnel. A combination of both Anthrax Vaccine Adsorbed

and the relevant antibiotics (Ciprofloxacin or Doxycycline) should lead to close to 100 percent survival. Failure to treat until after symptoms begin changes the estimated survival rate to only 11 to 14 percent. This shows the need for early warning and good biological warfare early warning sensors. Unfortunately, the United States and its allies are still in the "detect to treat" rather than the far more favorable "detect to warn" mode of operations, and changes in our alerting capabilities could save tens of thousands of lives in a biological warfare scenario.

The military science and technology (S&T) community has been working very hard to give the warfighter and homeland defender a variety of new tools to help them survive, fight, and win either on the chemical and biological battlefield, or on the home front. Note the array of chemical and biological defense technologies that have been deployed in the field since Secretary Aspin's Counterproliferation Initiative was begun in the areas of individual protection, collective protection, decontamination, medical assistance, contamination avoidance, information systems, modeling and simulation, and CBRN protection and response. (See Figure 3.)

Figure 3. Chemical and Biological Defense Technologies: Reducing the Threat with Enhanced Capabilities[11]



However, in some other areas of passive defense, major deficiencies still exist. Out of the fourteen biological agents deemed most useful for weaponization, the United States has still fielded only four vaccines that have been given the Food and Drug Administration (FDA) stamp of approval. In some cases, even where a FDA-approved vaccine exists, no adequate supply of the vaccine has yet been purchased. In several cases there is no usable vaccine yet in sight despite the passage of a decade when, with proper funding and dedication to finding workable solutions, vaccines might have been available now to protect U.S. armed forces.

Indeed, had there not have been the Al Qaeda attacks of September 11, 2001, followed by the October-November 2001 anthrax-through-the-mail attacks, there would likely have been even less progress in vaccines, antibiotics, anti-viral drugs, and the stockpiling of emergency medical supplies.

Because our intelligence is limited about the kinds of chemical and biological agents that rivals like North Korea or Iran might possess, and because such programs are easy to conceal and are inherently difficult to detect using U.S. national technical means, it is wise to adopt a capabilities-based passive defense approach rather than a threat-based one. Thus, even if an adversary CB threat has not definitively been detected, it is wise to prepare for the contingency of adversary CB use if it is within their capability to produce and use such arms.

DHS Support for Passive Defense

As of FY 2004, nine out of ten federal dollars spent on passive defense against BW are spent by the Department of Homeland Security (DHS). The U.S. Congress has recently passed, and the DHS has pushed, the Bioshield and Biosensor programs that should upgrade the U.S. vaccine development and biological sensor R&D programs. Department of Homeland Security programs already have sparked the acquisition of enough smallpox vaccine to inoculate every American citizen and created a Strategic National Stockpile (SNS) program whereby 50-ton "Push Packages" of all types of vaccines, medicines, decontamination agents, and emergency medical equipment are stored in a dozen locations across the United States in preparation for emergencies in all regions of the country. The Strategic National Stockpile has increased 50 percent from FY 2001

to FY 2004. The Strategic National Stockpile program should be duplicated and/or made available for overseas application as well and likely will be extended and adopted in hot spots abroad in the future where the CBRN threat is greatest.

The Al Qaeda attacks on the World Trade Center and Pentagon on September 11, 2001, have galvanized U.S. biodefense preparedness, even though it still has a long way to go to reach a satisfactory condition. Federal investment in biodefense is up 17 times from $294 million in the Department of Health and Human Services (HHS) in FY 2001 to $5.2 billion in FY 2004.[12] Each of the 50 states of the United States now has bio-terrorism response plans in place, including mass vaccination plans, and all have created disease reporting systems that should rapidly detect a bioterrorist event.[13] The U.S. Centers for Disease Control (CDC) has drafted model legislation on emergency health powers for states to adopt in order to deal with such crises.

The Laboratory Response Network, connecting labs that can help in a bio-attack emergency, has been expanded from 80 labs in FY 2001 to 145 labs by FY 2004.[14] The number of state and local public health labs that are approved for work at the biosecurity level three (BSL-3) has expanded to 47, four times the number in 1999.[15] In FY 2003, the U.S. Centers for Disease Control provided specialized bioterrorism training to 8,800 key lab technicians. Eleven new high-level biocontainment research laboratories are currently being funded by the National Institutes of Health (NIH). These could be made available also for assistance in a public health response to a bioterrorist event.[16]

Moreover, the Department of Health and Human Services has expanded the U.S. Centers for Disease Control Public Health Information Network to reach one million public health professionals, including those in 90 percent of all county public health agencies. Further, almost 174,000 health professionals have been trained in FY 2003 and FY 2004 through Health Resources and Services Administration's Bioterrorism Training and Curriculum Development program.[17]

The Department of Health and Human Services has quadrupled the Readiness Force in the U.S. Public Health Service Commissioned Corps from 600 in FY 2001 to about 2,300 in FY 2004. The Food and Drug Administration has increased its imported food inspections at ports of entry from 40 ports in 2001 to 90 ports in FY 2004 and has conducted

eight times more such inspections.[18] Also since the September 11, 2001, Al Qaeda attacks, the Food and Drug Administration created a Food Emergency Network, with 63 laboratories serving 34 states to deal with possible food poisoning events.[19]

The National Institutes of Health has invested in new and improved vaccines against smallpox and anthrax. The smallpox vaccine supply has increased from 15.4 million to over 300 million doses, enough to vaccinate all U.S. citizens, if required. The National Institutes of Health has also developed an Ebola virus vaccine that has worked in monkeys and is now being tested on human volunteers.[20]

The National Institutes of Health also established eight Regional Centers of Excellence for Biodefense and Emerging Infectious Diseases Research.[21] Further, in 2002 the U.S. Centers for Disease Control in collaboration with the Department of Justice created a Forensic Epidemiology course to train public safety and law enforcement professionals to aid in investigations. By 2004, 42 of the 50 states had participated and 5,000 professionals were trained.[22]

This progress in bio-defense made by HHS and the Department of Homeland Security also arms the United States with greater protection, expertise and bio-defense assets that can be copied or borrowed by the warfighter community in foreign wars.

Other Medical Defenses

Clearly, in the realm of vaccine research and distribution to counter infections from biological weapons, there has been some impressive improvement. Most U.S. active duty military personnel assigned to forward areas in conflict zones have been vaccinated against anthrax. Moreover, the United States now has enough smallpox vaccine to inoculate the entire U.S. population, including all U.S. military personnel should the need arise. Unfortunately, as of this writing, the anthrax vaccination program has been at least temporarily halted by court order until more safety tests can be conducted. The DoD is appealing this ruling, arguing that the vaccine is safe.

While it is reassuring that U.S. defenses against these twin scourges, anthrax and smallpox, have been improved, that does not protect U.S. forces and citizens against the consequences of several other biological

agents that could be used as weapons of war or terror. The United States currently has only a few FDA-approved vaccines such as those for cholera, plague, smallpox, and anthrax. Even in these, the cholera vaccine is not recommended for routine protection in endemic areas and the plague vaccine, while FDA-approved, is no longer available in quantity.[23]

Some counter-BW vaccines are in what is called the "Investigational New Drug (IND)" status, awaiting Food and Drug Administration approval pending further trials. The vaccines for Q-fever, tularemia, Venezuelan equine encephalitis (VEE), viral hemorrhagic fevers, and botulism are in this Investigational New Drug category and are in very short supply.[24]

No vaccine at all currently exists that is effective against such biological agents as glanders, brucellosis, staphylococcal enterotoxin B, ricin, or T-2 mycotoxins and a myriad of other diseases that could also be weaponized in the future.[25]

It is especially recommended that the Departments of Defense and Homeland Security give top priority to several medical chemical and biological defense Science and Technology programs, namely:[26]

- multi-agent biological warfare agent vaccines and medicines,
- programs to provide earlier indications of biological warfare attacks and infections,
- drugs to provide short-term biological warfare agent protection,
- antivirals for pox and hemorrhagic fever virus,
- medicines and vaccines to combat adversary fourth generation chemical warfare agents, and
- plasma technology to neutralize BW agents.

With regard to the non-thermal plasma technology cited above, the Air Force Research Laboratory is presently testing two portable devices to neutralize biological agents, one that uses high powered pulsed microwaves, the other atmospheric pressure plasma to kill the bacteria and viruses. High energy electrons are discharged to preferentially interact with and destroy or neutralize otherwise harmful biological agents. The Non-Thermal Plasma Technology, still in the research and development stage, is designed to suck in air particles, neutralize them, and thereby

clean rooms, aircraft, vehicles, and containers without using the foams, solvents, or bleach that could otherwise harm both ordinary and sensitive materials.

Sensor Upgrades Needed

In addition, new types of bio-detectors are needed that can identify the contents of aerosolized clouds being borne by wind currents in the direction of U.S. and allied forces. Bio-sensors are also needed that can provide rapid and accurate information on bio-contamination over a wide area, as opposed to the current point detectors like the Biological Integrated Defense System (BIDS), a road mobile laboratory developed in the mid-1990s after Desert Storm.

Science and Technology research also needs to provide improved reconnaissance capabilities to detect biological and chemical agents already on the surface and to identify the areas contaminated from those that are clean. Such improved sensors need to be integrated into a centralized battle management command and control system at military bases and ports.

Of course, during the period from 1991 to 2004, the U.S. armed services have shown some improvement in both biological and chemical sensors despite funding problems and a failure to put anyone in charge of the entire effort until the late 1990s. The M-22 Automatic Agent Detector/Alarm was introduced together with the M21 Remote Sensing Chemical Agent Alarm, and the Improved Chemical Monitor. Also, the Combatant Commands began to introduce Dry Filter Units to sample bio-agents in the air at their installations. Both the U.S. Army and Marines fielded improved radiacs to help detect radiation and give warning.

A new array of chemical and biological agent detectors were in U.S. hands by 2004[27] including the:

Chemical Sensors:

- Automatic Chemical Agent Detection Alarm (ACADA), a man-portable vapor alarm that serves as a point detector and identifier of nerve and blister agents;
- Joint Chemical Agent Detector (JCAD);

- Improved Chemical Agent Monitor (ICAM);
- Chemical Agent Monitor (CAM);
- Improved (Chemical Agent) Point Detection System (IPDS) installed on naval vessels to detect nerve and blister agents;
- Joint Services Lightweight Standoff Chemical Agent Detector (JSLSCAD);
- Shipboard Automatic Liquid Agent Detector (SALAD);
- Joint Services Lightweight NBC Reconnaissance Systems (JS NBCRS) (also detects biological, radiological and nuclear contamination);
- Joint Warning and Reporting System (JWARN) (for CBRN agents); and the
- Artemis, a standoff chemical agent detector still in research and development, that scans threat clouds in all directions out to 20 kilometers or more. It will be used on a variety of land, sea, and air platforms.

Biological Agent Sensors

- Biological Integrated Detection System (BIDS);
- Interim Biological Agent Detector (IBAD);
- Joint Biological Point Detection System (JBPDS) provides a common sensor that can identify a biological agent in 15 minutes that began to replace IBAD in 2003;
- Joint Biological Remote Early Warning System (JBREWS);
- Joint Biological Universal Detector (JBUD); and the
- Joint Biological Standoff Detection System (JBSDS) is a research and development project that when perfected is expected to use a LIDAR beam to detect aerosol clouds out to a range of 15 kilometers for particulate matter and identify the existence of biological particles out to 3 kilometers.

Radiation Agent Sensors

- The AN/UDR-13 Radiac Set, a compact handheld, pocket-size tactical radiation meter which measures gamma/neutron doses in the vicinity;
- The AN/VDR-2 Radiac Set, a handheld or vehicle-mounted sensor to detect and measure nuclear radiation from fallout;
- The AN/PDR-75 Radiac Set that measures dose exposure of individuals to gamma and neutron radiation; and
- The AN/PDR-77 Radiac Set that measures doses of alpha, beta, gamma and x-ray radiation.

The standoff chemical, biological, and radiation sensor systems, in particular, once perfected, will be the beginning of the U.S. military's capability to provide adequate warning to its forces to get into protective gear and shelters prior to the arrival of a chemical or biological attack.

Once the U.S. and allied military forces have turned the corner in transitioning from a detect-to-treat situation to a detect-to-warn capability, all personnel will be significantly safer from chemical and biological attacks. Much research and development work on standoff sensors remains before this becomes a reality.

In addition to these detectors, Portal Shield is also an interim capability for bio-detection at high value fixed overseas sites. It was initially deployed in 1998 and has been introduced to numerous sites as of 2004. Portal Shield uses a network of sensors ringing a base or facility, linked to the command and control of a centralized computer accessible to the site commander. Portal Shield is to be replaced by the more advanced Joint Biological Point Detection System (JBPD) which works faster and is more accurate.

Also, highly desirable will be the invention and deployment of methods and equipment for identifying fourth generation chemical warfare agents and other new technology agents (NTAs). Moreover, improved decontamination materials are required.

While substantial progress has been made in biodefense, in the area of decontamination of equipment and personnel that have been exposed to chemical agents, only marginal progress has been made. The U.S.

military still relies on chemical agent decontaminants like bleach that are too caustic for cleaning up both contaminated personnel and equipment.

One useful new decontaminant for personnel that has been introduced in the last ten years is the Skin Exposure Reduction Paste Against Chemical Warfare (SERPACWA) product. Another recent innovation is the XM-100 Sorbent Decontamination System (SDS), an aluminum oxide powder to remove chemical contaminants from the surface of facilities and equipment, and reduces the need for water. Also, it is being examined by the FDA for possible application as a skin or open wound decontaminant.

There has been limited success in developing new decontaminants that will not ruin the surfaces of equipment or glaze over windshields of aircraft or land vehicles that have been coated with toxic chemicals. Nor has an effective way been found to decontaminate rubber or plastic that has been exposed to chemical warfare agents. Instead, such materials absorb the chemicals and remain toxic for long periods, thwarting all present remedies.

As noted there have been a number of new chemical agent detectors introduced to the field in the past few years. However, laying down M-8 detection paper or M-9 detection tape is still considered the best way to detect the areas contaminated by chemical warfare agents, to help indicate what places are safe and which are still dangerous. It would be valuable to operations and personnel if chemical "markers" were produced to be sprayed over areas and when in contact with toxic materials, to turn color or otherwise show areas of contamination so that operational workarounds of hot spots could be more safely and rapidly done.

Considerable progress has been made in designing new chemical and biological sensors. The Portal Shield sensor suites are a first step toward ringing military bases and facilities with a detection and warning system vis-à-vis biological warfare attacks, but the system, like most of the other detectors in the field, is far from perfect, causing far too many false alarms.

The Fox Vehicle and the Biological Integrated Detection System (BIDS) are mobile, protected laboratories for detecting and identifying chemical and biological agents, respectively, an analysis that can provide point detection and identification within 30 minutes.

Although considerable research and development work on standoff detectors is proceeding, there is nothing yet in the field that can detect

aerosolized agents drifting in clouds toward a targeted area. Something like this is needed to provide detection to warn friendly troops to don protective chemical and biological gear before the hazard arrives. At present, our sensors only confirm the presence of chemical and biological agents after they have contaminated an area, and all such detection is point detection, not wide area detection. What is most needed is a "detect to warn" system, rather than the present "detect to treat" system where the first sign of an attack may be the physical symptoms of victims reacting to chemical or biological attacks.

Passive Defense: Is a Quick Fix Possible?

The slow pace of research and development in biodefense sensors and the serious biological warfare threat that exists has led some analysts to search for immediate and commercially available off-the-shelf remedies for protecting personnel living and working at fixed military bases that face potential biological attacks.[28] Much of the danger of biological warfare or biological terrorist attacks could be alleviated if the targeted personnel were to don inexpensive N-95 masks to filter out the biological microbes, since aerosolized BW agents are the main threat.

How would personnel know when to don their masks? This might be required when the threat indicators were highest. For example, it would be wise to wear masks when the intelligence agencies signaled that the threat was higher than usual, for example Threat Level "Charlie" or "Delta," especially when this warning level coincided with optimal meteorological conditions for a biological warfare attack from the standpoint of those behind it. Thus, masks should be worn when the intelligence warning levels are "Charlie or higher" and, when simultaneously, there were cool cloudy overcast days or cool nights, when a temperature inversion was likely. The N-95 masks are much less cumbersome, restrictive and uncomfortable than the rubberized gas masks now issued.

The masks normally worn by military personnel are restrictive and expensive, costing anywhere from $170 to $210 or more each. However, a normal $20 painter's filter mask (N-95) can filter out one-to-five micron diameter biological particles, the kind that is most dangerous and likely to stick when breathed into the lungs.

It would also greatly aid the ability of our Combatant Commands to provide passive defense against CBRN attacks if the science were better understood in several areas where currently some uncertainty exists. One such area for further research is in understanding the evaporation and neutralization rates of toxic chemical and biological agents in different environments. Another area where better understanding could improve passive defense is research in the effects on personnel of lower levels of chemical toxicity than we have previously investigated. A third area where the payoff for passive defense might be very high is research that throws light on the validity for humans of animal testing of chemical and biological agents antidotes and vaccines. A fourth area recommended for closer research investigation is further analysis of the mechanisms by which disease spreads or chemical agents work in the body in order to design appropriate doses of antidotes and other medications.[29] These four science and technology research projects, if successful, can help the Departments of Defense and Homeland Security provide more effective passive defense protection to the warfighter, emergency responder communities, and to victims of CBRN attacks.

VI. Consequence Management

Maximum Consequence Management

The ideal consequence management capability to cope with CBRN warfare will provide the means of avoiding, decontaminating, and reconstituting operations after such an attack. This ideal reconstitution of a fighting force can be facilitated first by understanding the likely persistence of a toxic CBRN environment. Once the "science" is understood, effective counter-CBRN concepts of operation can be implemented by applying the best and most appropriate tactics, techniques, and procedures (TTPs) to avoid, eliminate, and work around the toxic hazards.

Clean-up of contaminated areas in an ideal system will be conducted by spraying areas with "markers" that turn color or provide other physical indicators of agent activity when brought in contact with CBRN agent contamination. Then, in the ideal consequence management system, all contaminated personnel, equipment, and areas could be de-toxified by applying available, effective but benign decontamination agents that can completely neutralize the CBRN agents without harming the personnel or equipment being treated.

Further, the ideal consequence management program will have worked out a system for dealing with contaminated aircraft, ships, and other equipment both for decontamination, and for isolation and reconstitution. Landing and basing of such assets and procedures for cleaning and recertifying them for renewed use would be worked out in agreements previously articulated to the satisfaction of U.S. and allied governments to facilitate operations in a CBRN theater. Standards would also have to be agreed upon that define minimal standards of how clean the equipment or personnel have to be before they could be admitted on the soil of receiving states or before they could be returned to action. The answer to the "how clean is clean?" question must both protect those dealing with the contaminated persons and equipment and must also not be set so impossibly high that it paralyzes the nation's warfighting capability. Moreover, it needs to be addressed well in advance of the conflict so as to facilitate timely and appropriate contingency planning and actions and to avoid nasty show stopping surprises in the middle of a war.

Progress and Shortfalls in Consequence Management

If, despite our best efforts, an enemy succeeds in inflicting damage through CBRN attacks, it then falls to U.S. (and allied) forces to clean up the target area, resurrect the damaged capability, bind up the wounds of casualties, and bury the dead. Consequences must be managed to limit the damage, reconstitute the force, and keep U.S. and allied operations up and running so as to continue to carry the fight to the enemy.

How much better prepared are we now to manage consequences of CBRN strikes than we were in 1993? What shortfalls remain? Progress in consequence management has been made on several fronts. First, the United States and its allies are somewhat improved in the areas of passive defense, active defense, and counterforce so that against the same level of CBRN attack as could have been launched a decade ago, there should be fewer consequences to cope with than was the case then. On the other hand, the CBRN threat likely has grown along with U.S. consequence management countermeasures, so that despite U.S. improvements in organization, training, and equipment, we are still falling short of an adequate response capability to CBRN weapons attacks.

Nevertheless, there have been major improvements in our appreciation of the danger of CBRN attacks in the wake of (1) repeated Al Qaeda attacks over the last decade, (2) the October 4 to November 21, 2001, anthrax letter deliveries,[30] and (3) the October 2001 major cyberattack that cost the United States $3 billion in repairs.

This heightened appreciation of CBRN dangers has led both the administrations of President William Clinton and President George W. Bush to issue strong new policy and guidance to the U.S. Armed Services and to Domestic Emergency responders to prepare better for consequence management of CBRN attack contingencies both abroad and within the continental United States. Consequence management of CBRN attack effects will be the joint responsibility of the Department of Defense and Department of Homeland Security, with the origin and location of the attack determining who has primary responsibility for response.

The United States has made progress over the decade in expanding the number of laboratories capable of rapidly identifying chemical and biological agents. Efforts have succeeded in improving the U.S. surveillance and detection of biological outbreaks and in differentiating

natural from man-initiated events, and a good deal of thought has gone into how to achieve further early warning and in identifying the sources of outbreaks.[31]

Another area of improvement is in understanding and preparing to combat panic, and to provide U.S. forces and private citizens effective public affairs guidance during and after a weapon of mass destruction event to reduce the number of "worried well" flooding hospitals, and to improve constructive responses to a serious crisis either at home or in the battlespace.[32]

All this is positive. Nevertheless, much still needs to be done before consequence management preparations can be considered adequate. Since 1993, despite an increased concern about weapons of mass destruction effects, only a small amount of study has gone into what kinds of public information procedures will be needed to limit panic and reduce adverse psychological reactions to a CBRN attack. Medical facilities could easily be overwhelmed both in the military's battlespace and at home in terrorist scenarios if the "worried well" were not rapidly sorted out from the "physically impaired" after a weapon of mass destruction strike.

Only in a preliminary way, through several Defense Threat Reduction Agency conferences and workshops, has this problem of controlling adverse behavior of U.S. and allied personnel during a CBRN crisis or attack been addressed. The USAF Biodefense Task Force and the Strategic Integrated Process Team of the Contamination Avoidance at Sea Ports of Debarkation (CASPODS) Advanced Concepts and Technology Demonstration (ACTD) have analyzed, brainstormed, and discussed the means of using public announcements, training, and public affairs bulletins to mitigate panic, provide effective information, and squash rumors before they take on a life of their own.[33]

Modest gains have been made in some areas of consequence management since 1993. The Restoration of Operations (RestOps) ACTD made some progress in policies for handling human remains after a CBRN event at an airbase, but considerable further mortuary affairs work remains. Organizing U.S. forces and on-scene responders for weapon of mass destruction events has resulted in the creation of the USMC Chem-Bio Incident Response Force, the U.S. Army Tech Escort Units, and U.S. Army Reserve weapons of mass destruction Civil Support Teams in 32 states by 2004, with all 50 states to have them by 2005. These second-

responder units could help restore services and public confidence and restore order in areas affected at home.

Decontamination agents exist to clean up toxic areas, but much additional work needs to be done to create non-caustic decontamination agents that can be immediately applied. No work appears to have been done to develop CBRN "markers" to identify the contaminated from uncontaminated areas where chemical and biological attacks had occurred in the proximity. Only M-8 paper and M-9 tape are currently available to be applied by ground-based personnel. It is to be hoped that markers will be developed that would turn color or otherwise give indication when in contact with toxic chemical or biological agents, and that could be delivered over wide areas in a timely manner, perhaps by air, to give commanders and their units a rapid appreciation of where chemical or biological toxicity exists and where safe areas are located.

Within the United States, domestic weapons of mass destruction events will be handled first by the Department of Homeland Security, with Federal Emergency Management Agency (FEMA) taking the lead in consequence management and the FBI in crisis management. The Department of Defense will be a supporting rather than the lead department in domestic consequence management activities.

With regard to overseas weapons of mass destruction events, the U.S. Department of State has the formal lead role in U.S. consequence management activities in aiding a foreign government which takes the overall responsibility for directing such efforts. The Department of Defense will be a key supporter of the State Department in such consequence management abroad, especially in airlifting needed equipment and supplies to the areas affected. Given the paucity of resources directly available to the Department of State, it is certain that the Defense Department will play a key role in support since its resources abroad are far more extensive.

There are spectrums of new threats that neither U.S. forces abroad nor U.S. responders at home have adequate capabilities to cope with. These include the ability to neutralize so-called fourth generation nerve agents and genetically altered biological agents. Further, in a target-rich environment, it is likely that defensive and consequence management programs will continue to lag far behind the offensive CBRN possibilities available to rogue states and terrorists.

VII. Counter-CBRN Operations: Suggestions for Combatant Commander Plans

Counter-CBRN Operations will focus on eliminating enemy weapons of mass destruction as early as possible in a conflict, if possible. We must get them before they can get us. Failing that, effective active defenses become paramount. If you can't eliminate such massive threats before they are launched, it is imperative to intercept them enroute. If there are failures in both counterforce and active defense, then survival of one's forces is reliant on effective passive defenses or dependent upon placing units in positions where they are difficult to eliminate. This means staying out of enemy range or dispersing forces, and removing civilians, if possible, from the combat zones.[34]

Preemption versus enemy weapons of mass destruction assets or preventive war launched with the element of surprise is, in most cases, an unrealistic option against such heavily armed opponents. First, as Operation Iraqi Freedom illustrated all too well, the United States and its allies may have unreliable intelligence about the number, type, and location of adversary CBRN weapons. It is difficult to target assets that you lack such intelligence about.

Furthermore, unless preemption works completely, it is likely that enemy weapons of mass destruction retaliation will take place against the United States forces by an enemy leader who figures he had better use, rather than lose, such forces to further U.S. attacks. A wounded enemy with weapons of mass destruction could exact a terrible price for a botched U.S. counterforce strike.

A preemption strategy might work in a very few scenarios such as the Israeli strike on Iraq's Osirak nuclear reactor at a time when there was a single unprotected very high value target and the Iraqis, embroiled in a fierce war with Iran, were not equipped to retaliate. However, facing an opponent with a weapons of mass destruction retaliatory capability is an altogether more dangerous proposition. A better strategy is to rely on the overwhelming U.S. nuclear and conventional deterrents to such action unless one's intelligence is absolutely complete, the counterforce strike is very likely to be successful, and the WMD threat is deemed imminent.[35]

Should a conflict escalate to the use of chemical, biological, or nuclear weapons, despite the best U.S. effort to deter their use, U.S.

counter-CBRN military doctrine and concepts of operations (CONOPs) will be needed to protect U.S. personnel.

Shortfalls in operational plans still exist in such areas as how to conduct resupply and reinforcement using strategic lift assets in contaminated areas where air and sea transports may become toxically coated. Still to be determined is how to recover such aircraft and ships after VX, sarin, or anthrax contamination. Still to be decided is where to take such aircraft and ships for decontamination, what cleanliness standards to set for re-employment of such aircraft, and what criteria to choose for introducing such valuable assets into a CBRN scenario where contamination might lay waste to a very expensive and hard-to-replace aircraft or ship.

The U.S. Combatant Commands are still evaluating how to fight an opponent who may use an array of biological weapons, a type of war the U.S. military has yet to fight in the modern era. Given the potential strategic nature of biological weapons, this uncertainty is an ominous sign. Indeed, the uncertainties about how to fight a biological war is perhaps the single most serious flaw in U.S. military operational plans at present and needs to be addressed as soon as possible.

In the past decade, the U.S. Air Force has led the way in developing a new Counter-CW concept of operations at air bases to keep aircraft sortie rates high even in the midst of ballistic missile attacks using chemical weapons. The Counter-CW concept of operations, features initial protection of aircraft, crews, and equipment using shelters and coverings, followed by base reconnaissance and split-MOPP operations, where the amount of protection adopted depends on the amount and locations of chemicals. One favorable factor was the discovery that blister and nerve agents are rapidly absorbed by the asphalt and concrete of runways. Tactics, techniques, and procedures (TTPs) for handling potential hazards, and risk evaluation decision tools for commanders promise to keep most U.S. attack aircraft in the air despite the base being "slimed."

As previously discussed in great detail, the Air Force is now working on a counter-biological concept of operations element to augment its C-CW concept of operations. Eventually, this will be augmented by a counter-radiological concept of operations element, counter-nuclear concept of operations element and perhaps a counter-high yield explosive CONOPs element so that an overall Counter-CBRNE concept of

operations will provide guidance to commanders if faced with such threats. This goal will be difficult to achieve should an enemy use a combination of, say, both chemical and biological weapons in the same campaign, since the concept of operations for each may differ or even be opposed to each other in some scenarios.

Finally, in the event of another campaign along the lines of Operation Iraqi Freedom, where U.S. Forces clash with an adversary armed with chemical, biological, radiological, or nuclear weapons, U.S. forces have to be organized, trained, and equipped for the WMD elimination mission. WMD elimination should not be an ad hoc "pick up game," but must be institutionalized in our deliberate planning.

U.S. forces must be able to systematically and comprehensively remove an adversary state's CBRN programs by eliminating their capacity to do CBRN-related research, production, testing, storage, deployment, or use of such weapons in the foreseeable future. As one recent study summarized:

> "Conceptually, WMD elimination may be divided into three main tasks. Exploitation refers to locating, characterizing, and securing and functionally defeating an adversary's WMD sites, documentation, personnel, and materials. Forensic evidence is developed as necessary. Destruction refers to rendering safe, dismantling, destroying, removing, or otherwise safely and verifiably disposing of weapons, materials, equipment, and infrastructure. Monitoring and redirection are intended to prevent the WMD threat from reconstituting, including the "conversion" of WMD activities and personnel. These tasks may be sequential for specific WMD sites but are likely to be simultaneous for larger WMD programs. Planning should reflect this, especially because each of the tasks requires some unique capabilities in terms of skill sets and expertise, equipment, and so forth."[36]

VIII. Counter-CBRN Planning, Education, Training, and Exercises

In the years since Secretary Aspin launched the DoD Counterproliferation Initiative there has been some substantial progress in the way that the Department of Defense and the military services have organized themselves to make decisions on Counter-CBRN issues and programs. Note the reformation in the DoD Chemical and Biological Defense Program that took place from 1996 to 2001 and that serves DoD today.

In addition, the Air Force, in 1997, issued a service-wide Counterproliferation Master Plan that set out objectives and called for initiatives to improve USAF counterproliferation capabilities. Among these, "in the area of passive defense, the Master Plan called for a continuing process of scientific research, operational analysis and capability improvements with the following objectives:

- Improve technical and scientific knowledge of chemical/ biological agent behavior.
- Identify and assess the operational implications of CBRNE attacks with enough precision to understand and quantify their effects on operations.
- Develop and implement USAF policy, doctrine and guidance governing actions to counter the effects of CBRNE attacks."[37]

Other services would be wise to develop their own C-CBRNE Master Plans and Roadmaps based on this USAF model. In both the USAF Masterplan and the USAF Counter-CBRNE Roadmap, the Chief of Staff of the Air Force has required that USAF education, training, and exercises (ETE) be designed to prepare every Airman with the kind of understanding of CBRNE threats and countermeasures that will allow them to survive, operate, and win in conflicts where such weapons are available to the adversary. Such Counter-CBRNE education, training, and exercises must be realistic and appropriate to the kinds of career paths each Airman takes, at each step during their time in the service from when they join to the time they separate.

In the professional military education (PME) of U.S. military officers on these Counter-CBRN topics, several PME institutions have taken the lead. The Army Chemical School produces first-rate technical experts in dealing with countering CBRN threats. The Air University, particularly the Air War College in combination with the USAF Counterproliferation Center staff, have provided the most extensive number of elective courses on the subject. Other leading institutions that have specialized courses in this field are National Defense University in combination with their WMD Studies Center and the Naval Post-Graduate School. Several other PME schools have a course or two each on Counter-CBRNE issues but much work needs to be done to educate, train, and exercise military officers of all ranks on the threats these potent weapons pose and best practices for countering them in future conflicts.

IX. International CP Cooperation

Ideal International Counterproliferation Program

In the optimal coalition situation, each unit in the coalition will be equipped fully with the same quality and quantity of individual protective equipment, the same collective protective shelters, the same quantity and quality of medicines and vaccines, and have the same high quality sensors to alert them of contamination and incoming attacks sufficient to warn them in time to don protective equipment and take adequate protective shelter. Each element of the coalition will fall within the protective umbrella of effective and multi-layered or multi-shot missile and aircraft defenses. Further, each element of the coalition will have sufficient counterforce capability and dedicated persistent overhead intelligence, surveillance, and reconnaissance assets to rapidly degrade the launchers and missiles that could threaten CBRN attacks upon them. Finally, each unit in the coalition should possess skilled first and second responders, and other well equipped and practiced consequence management capabilities against the most likely CBRN threats. The entire coalition should be thoroughly trained in specific counter-CBRN concepts of operations for continuing military operations on land, sea, and air during a conflict, including frequent training in such concept of operations and tactics, techniques and procedures to sustain operations and accomplish the mission. The entire coalition should also have an integrated command and control structure, should be organized, trained and equipped for CBRN warfare to a common standard, and employ a common military doctrine and operational war plan for conducting military operations in a CBRN environment.

Progress and Shortfalls in International Cooperation

Unfortunately, only some grudging progress has been made to get allied states involved and taking steps to counter CBRN threats to their forces and societies but, to date, there has been far more talk than action by most. The NATO states' leaders with one exception (the United Kingdom) either do not appear to believe the weapons of mass destruction

threat is imminent or do not want to confront the economic costs of serious preparations against such a threat. They are slowly investing in one missile defense system, the Medium Extended Range Air Defense System, but overall progress in counterproliferation organization, training and equipping is slow or virtually non-existent.

The same is true of Japan and Arab states in the Persian Gulf. For example, there have been numerous annual meetings of the Cooperative Defense Initiative group, including the United States and the Arab states of the Gulf, but the physical progress toward either a counterforce, active defense, passive defense, or good consequence management capability is very much more theory than accomplished fact. At least it is a topic for consideration of the military leaders of those allied countries and regularly scheduled meetings on the topic are held, but the political will and budgeting does not currently exist to translate these talks into much concrete action. It is as if each such ally is deciding to let the United States provide the defense or they are waiting for a weapons of mass destruction disaster before they will be willing to act seriously.

Unfortunately, if Counter-CBRN preparations by the United States over the last decade are still inadequate, they still far exceed the C-CBRN efforts of U.S. allies, with the exception of the United Kingdom and Israel. Among U.S. allies, only Israel has erected its own independent active defenses against ballistic missiles. Israel, the exception to the rule, depends on their terminal-phase Arrow theater ballistic missile defense program, as well as, in some crises, the U.S. Patriot-3 batteries for protection, but even this tandem of missile defenses offers only a partial answer to such threats. Israel also has a serious vaccination program in place and has created programs to give them a practiced passive defense and consequence management capability should enemies attack them with either chemical or biological weapons. Israel also has a serious aircraft-based counterforce capability and has in the past been willing to preempt adversary positions and assets in their ongoing conflict with Palestinian Arabs and adjacent Arab states. For example, Menachem Begin ordered the destruction of the Iraqi Osirak nuclear reactor in June 1981 to prevent Saddam Hussein from developing Iraqi nuclear arms that might have otherwise been used later against Israel.

Japan has just agreed to participate in a bilateral effort to develop theater missile defense systems to offset the North Korean No-Dong threat

and possible future Chinese missile threats as well. The U.S. allies in Europe have been working with the United States in a joint program to develop the Missile Extended Air Defense System to provide a mobile defensive bubble over allied ground troops moving in wartime within enemy missile range. The Missile Extended Air Defense System is a terminal phase interceptor, as is the Israeli Arrow interceptor. Only the United States is funding R&D work on more extended range (mid-course, post-boost, or boost phase) interceptors such as the Terminal High Altitude Air Defense, the Navy Wide Area Missile Defense, or the Airborne Laser programs.

States like the Republic of Korea, our Persian Gulf Arab allies, our NATO allies, Japan, and others have very weak passive defense programs lacking in adequate quantities or quality of protective masks, suits, collective protective shelters, decontamination capabilities, vaccines, inoculated personnel, and pre-positioned medical supplies and equipment. Only the Israelis and the British forces have adequate vaccine inoculation preparations against possible future biological attacks by adversaries armed with anthrax and smallpox.

U.S. Central Command has worked with U.S. Arab state allies in the Persian Gulf to better prepare them against chemical and biological warfare and chemical and biological terrorist threats. That is the mission of the Cooperative Defense Initiative program, whereby top military leaders from these states have met with top U.S. experts over the past four years on cooperative chemical and biological defense preparations and training.

Similarly, the U.S. Central Command has held a series of Desert Breeze tabletop exercises on how to fight a chemical and biological war in the Gulf, involving the U.S. Central Command Combatant Commander and his planning staff. A similar series of exercises is run by the U.S. Pacific Command Combatant Commander and his staff, titled Coral Breeze, to analyze how to best cope with an adversary like North Korea that is armed with chemical and biological weapons. These Combatant Commander exercises take into account the state of counter-CBRN readiness of allies in each region, and lessons learned are reviewed and shared with our coalition partners.

One of the serious deficiencies in U.S. and allied defenses against CBRN attacks is the fact that allied military forces are so much more

vulnerable to chemical or biological attacks that U.S. forces may find themselves fighting with partners whose military prowess is greatly diminished after such an attack. Allied forces may be very impaired by such chemical and biological warfare scenarios and this, in turn, creates greater danger for U.S. forces.

Further, U.S. forces may become hamstrung if host nation or third party nationals who work the airbases and ports feel unprotected and refuse to stay and perform their jobs if CBRN weapons are threatened or used by an adversary. This is especially true if such base or port workers have to worry about protecting and/or evacuating families from the danger zones. This problem will be exacerbated if enemy military or terrorist organizations were to target Toxic Industrial Chemicals (TICs) and Toxic Industrial Materials (TIMs) in the area of U.S. and allied ports or airbases. The end result might be the same as or worse than if the enemy fired a ballistic missile armed with chemical weapons at the port or airbase.

Panic control measures need to be provided to keep host nation and third party national workers from bolting and abandoning their support roles at these bases and ports in wartime. Pre-crisis or pre-war training and education can solve some of these problems and alleviate unrealistic fears. Excellent command and control procedures coupled with first-rate communications from trusted authorities can cut panic, as can the rapid treatment and removal from sight of dead and wounded. Assignments of specific crisis jobs and protective responses can cut both real and psychological casualties. Also, each key worker needs some basic protection equipment, both individual protective equipment and collective protection shelters. Workers also need to be assured of emergency medical help, and should be acquainted with emergency response procedures learned in pre-war/pre-crisis drills. At key foreign ports of entry (seaports of debarkation or SPODs), the U.S. military and civilian authorities need to have negotiated agreements with host nations for how to administer the port in wartime. They need to agree on the conditions for replacing indigenous or third party national workers if necessary. Also, sectors of the port should be designated beforehand for use by the combatant forces in unloading equipment, supplies, and personnel. Berths should be assigned for docking military supply ships. Key port and airbase personnel should have dispersed housing, not collocated at the port

or airbase, and be provided toxic-free shelters near the work area as well as dependable transportation in the event of a CBRN attack or alarm.

Collective coalition plans for protecting all coalition units from CBRN strikes, both by properly equipping and training allied forces that are to fight shoulder-to-shoulder with U.S. personnel, and by protecting the civilian work forces at key bases and ports, will be essential when facing CBRN-armed opponents. Otherwise, U.S. forces may lack the allied support required for victory against a rogue state military using weapons capable of inflicting mass destruction, disruption, and casualties.

X. Summary of the CP Program Progress and Shortfalls

Areas for Capability Enhancement (ACEs)

Each year for most of the past decade, the U.S. Counterproliferation Program Review Committee produces an Annual Report to Congress and the Executive Branch where it lays out, in priority order, the areas identified by the Department of Energy, the Department of Defense, and the U.S. Intelligence Community that most need improvement in the coming years. These items are called "Areas for Capability Enhancement" or ACEs.

Unfortunately, progress has been slow in important counterproliferation areas and few ACEs have been solved and dropped from the list in the past decade. It is instructive to look at what the Department of Defense (DoD), Department of Energy (DOE), and the Intelligence Community (IC) all believe are the most important areas for capability enhancement. Note the priorities in Figure 4 each of the three have assigned to the following U.S. counterproliferation needs.[38]

Figure 4. Areas for Capability Enhancement (ACEs)

DoD	DOE	IC	ACEs
1		1	Timely collection, analysis, and dissemination of strategic, operational, and tactical level actionable intelligence to support CP and CT.
2		2	Detection, identification, characterization, location, prediction, and warning of traditional and nontraditional CW and BW agents (including medical surveillance).
3		3	Defense against, and detection, characterization and defeat of paramilitary, covert delivery, and terrorist WMD capabilities (including protection of critical CONUS and OCONUS installations).
4	2	5	Detection, location, and tracking of WMD/M and related materials, components, and key personnel.
5		7	Support for maritime, air, ground WMD/M interdiction, including special operations.
6			Enable sustained operations in a WMD environment through decontamination, and individual and collective protection.

Continued on page 54.

Figure 4. Areas for Capability Enhancement (ACEs) *(Continued)*

DoD	**DOE**	**IC**	**ACEs**
7			Medical protection, training, diagnosis, treatment, and countermeasures against NBC agents, to include surge manufacturing capability and stockpile availability of vaccines, pretreatments, therapeutics and other medical products.
8		**9**	Ballistic and cruise missile active defense.
9			Consequence management in response to use of WMD (including civil support in response to domestic WMD contingencies).
10		**6**	Target planning for WMD/M targets.
11	**3**	**4**	Detection, location, characterization, defeat, and elimination of WMD/M weapons and related facilities while minimizing collateral effects.
12		**8**	Detection, location, characterization, and defeat of HDBTs while minimizing collateral effects.
13		**10**	Prompt mobile detection and defeat.
14	**1**		Protection of WMD/M and WMD/M-related materials and components.
15	**5**	**11**	Support to export control activities of the U.S. Government.
16	**4**	**12**	Support to inspection and monitoring activities of arms control agreements and regimes and other nonproliferation initiatives.

Obviously each department, agency or command has a different set of priorities for enhancing U.S. counterproliferation capabilities depending on their own unique missions. Note, for example, the combined ACE priorities of the U.S. Combatant Commanders[39] as shown in Figure 5.[40]

Figure 5. Combatant Commander Prioritized Counterproliferation Requirements

Rank	Counterproliferation Requirement
1	Timely collection, analysis, and dissemination of Strategic, Operational and Tactical level actionable intelligence to support counterproliferation and counterterrorism.
2	Detection, identification, characterization, location, prediction and warning of CW and BW agents.
3	Enable sustained operation in a WMD environment through decontamination, and individual and collective protection.
4	Medical protection, training, diagnosis, treatment, surveillance and countermeasures against NBC agents, to include surge manufacturing capability and stockpile availability of vaccines, pretreatments, therapeutics and other medical products.
5	Support for Special Operations including WMD/M interdiction.
6	Defense against, and detection, characterization and defeat or paramilitary, covert delivery, and terrorist WMD capabilities (including protection of critical CONUS and OCONUS installations).
7	Ballistic and cruise missile active defense.
8	Consequence management in response to use of WMD (including civil support in response to domestic WMD contingencies).
9	Detection, location, and tracking of WMD/M and related materials, components and key personnel.
10	Target planning for WMD/M targets.
11	Detection, location, characterization, defeat and elimination of WMD/M, NBC/M and related facilities while minimizing collateral effects.
12	Detection, location, characterization, and defeat of HDBT while minimizing collateral effects.
13	Prompt mobile target detection and defeat.
14	Protection of WMD/M and WMD/M-related materials and components.
15	Support to export control activities of the U.S. Government.
16	Support to inspection and monitoring activities of arms control agreements and regimes and other nonproliferation initiatives.

Despite many progressive steps, much more obviously still needs to be done to provide an adequate U.S. defense against CBRN weapons at home and abroad. Funds are still limited within the U.S. defense budget for passive defenses against CBRN attacks, roughly $1 billion per year as opposed to roughly $10 billion spent in FY 2004 for ballistic missile defenses. Clearly, the U.S. military needs to prioritize better in how it allocates defense funding to U.S. counterproliferation programs.

Some suggest that the relatively slow pace of solving major CBRN threat problems could be partially cured by putting a "czar" over all counterproliferation programs, with an integrated budget and authority, enabling him or her to establish better priorities between the different program elements or pillars. This would create greater coherence among the various units needed to execute, for example, the Scud Hunt problem. A single counterproliferation czar would also provide leadership needed to address neglected programs such as cruise missile defense and could be held responsible for successes or failures for a program that, today, either finds no one in charge or too many trying to lead at once with the result that there is not sufficient unity of effort.

Despite key shortfalls in the U.S. counterproliferation effort there is still some consolation in the fact that the sum is greater than its various less-than impressive parts. For the most part, U.S. nonproliferation and counterproliferation policies have, up to now, been sufficient to prevent almost all chemical, biological, radiological, and nuclear attacks on its forces, allies, and population with the exception of the anthrax-mail attacks of October and November 2001 that killed five individuals, caused 22 total casualties and caused major disruptions on Capitol Hill and elsewhere.

Some consolation can be drawn from the fact that the very great majority of the over 190 countries in the world have neither used nor acquired CBRN weapons. It is only a handful of states that persist in pursuing such mass effects weapons, as well as several terrorist organizations like Al Qaeda. On the whole, U.S. and international efforts to erect arms control and nonproliferation treaty regimes such as the Non-proliferation Treaty, Chemical Weapons Convention, and Biological Weapons Convention, augmented by a series of export control regimes like the Missile Technology Control Regime, Australia Group, and two

nuclear suppliers control groups, have kept the weapons of mass destruction genie in the bottle with just a few important exceptions.

Treaties and export control regimes have been augmented recently by more than 60 states that have joined together in the Proliferation Security Initiative (PSI) to intercept dangerous shipments of missiles, CBRN weapons, CBRN agents, dual-use technologies, equipment, and components to prevent their transfer to other hostile hands. These programs have also been augmented by strong "carrot and stick" diplomacy to facilitate rollbacks in CBRN programs in places like Libya, South Africa, Ukraine, Belarus, and Kazakhstan.

Further, the U.S.-Former Soviet Union Cooperative Threat Reduction Program has achieved considerable success in destroying surplus nuclear, biological, chemical, and associated missile capabilities and in helping to secure fissile material in storage in Russia, Ukraine, and Kazakhstan. Efforts have begun to give alternative employment to scientist weaponeers and to secure existing nuclear, biological, and chemical assets.

This mix of nonproliferation policies, agreements, and programs is one solution to the weapons of mass destruction problem by helping to prevent the spread of these assets to adversaries. However, what treaties, export controls, diplomacy, the Proliferation Security Initiative, and the Cooperative Threat Reduction programs cannot do to dissuade states and groups from CBRN programs and use, U.S. and allied military countermeasures must contain.

Most rogue state leaders, even if they choose to pursue such CBRN capabilities, will likely be deterred from using such mass effects weapons by the U.S. and allied capability and threats to inflict a massive retaliatory attack on any aggressor state. Further, U.S., and allied preparations in counterforce targeting, active and passive defenses, and in consequence management all are likely to persuade any knowledgeable and rational enemy leader that our forces should be able to fight better in a CBRN environment than can their own personnel. This fact, if properly communicated and understood, should make a rational and informed enemy leader hesitate in launching the dogs of a CBRN war.

In conclusion, there are many shortfalls and deficiencies in U.S. and allied counterproliferation readiness and warfighting capability. Nevertheless, even mediocre capabilities in each area of the counterproliferation program, when combined, can serve as an important

safety net against unconventional and asymmetrical attacks. If the cords of such a safety net were made up of a single strand of thread, it is likely to break under pressure. But when many such strands are woven together, the net can provide strength and security. Such, too, is the U.S. and allied counterproliferation safety net. When all elements, "all 8 Ds" of counterproliferation work in tandem (disarmament, diplomacy, defusing, dissuasion, denial, deterrence, defense, and destruction) the whole effort is synergistic and can be greater than the sum of its parts.

This is not to say that the U.S. Government and its key allies can afford to rest and neglect the strands that make up this safety net. It would take only one CBRN war to wreak havoc on us. The United States and its allies can ill afford to be the unready confronting the unthinkable. In this era when even poor countries, small groups, or a few individuals now could possess and use weapons of mass destruction, inflict mass casualties, and cause mass disruption, all efforts must be made to mobilize the best minds and capabilities to meet and defeat the challenge of adversaries with CBRN weapons. To do less is to court a disaster unlike in its dimensions and scope anything we have ever previously suffered. Time and the momentum of events are not on our side. A maximum counterproliferation effort is needed in this second decade of the integrated counterproliferation program and even that might not be enough to protect us from the coming WMD storm.

Notes

1. William Branigin, "Senate Report Blasts Intelligence Agencies' Flaws," *Washington Post*, July 9, 2004, 1-2.

2. Jerrold M. Post, *Leaders and Their Followers in a Dangerous World*, (Ithaca, NY: Cornell University Press, 2004), xv-xvi. The CIA group was composed of an interdisciplinary team made up of area specialists, psychiatrists, social anthropologists, and other specialists.

3. "At the Crossroads: Counterproliferation and National Security Strategy," *A Report of the Center for Counterproliferation Research*, (Washington, D.C.: NDU, April 2004), 34-35.

4. Rex Kiziah, "Assessment of the Emerging Biocruise Threat," C*ounterproliferation Papers, Future Warfare Series, No.* 6, August 2000; Michael E. Dickey, "Biocruise: A Contemporary Threat," *Counterproliferation Papers, Future Warfare Series, No. 7*, September 2000. Both were published by the USAF Counterproliferation Center, Maxwell AFB, Alabama.

5. Of course, the ultimate would be to design effective individual protection equipment that is so user-friendly that there is little or no degradation in combat effectiveness when military personnel wear it. In the past and at present, that is far from the case. See Barry R. Schneider, "Combat Effectiveness in MOPP4: Lessons from the U.S. Army CANE Exercises," *The War Next Time: Countering Rogue States and Terrorists Armed with Chemical and Biological Weapons* (Maxwell AFB, AL: USAF Counterproliferation Center, November 2003), 173-182.

6. *Joint Service Chemical and Biological Defense Program FY02-03 Overview* (Washington, D.C.: Department of Defense, 2003), 28.

7. Major General (Dr.) Joseph Kelley, USAF Assistant Surgeon General for Healthcare Operations, Briefing on "Biodefense: The Air Force Medical System Approach," Washington, D.C., 8 December 2003.

8. Ibid.

9. Ibid.

10. Ibid.

11. Ibid.

12. See the "HHS Fact Sheet: Biodefense Preparedness," *The White House website*, 28 April 2004. On-line, Internet, 11 July 2004, available from http://www.whitehouse.gov/news/releases/2004/04/20040428-4.html.

13. Ibid.

14. Ibid.

15. Ibid.

16. Ibid.

17. Ibid. CDC's Centers for Public Health Preparedness (CPHP) helps prepare frontline health workers at the local level. There are now 34 such centers in 46 states.

18. Ibid. From 2001 to 2004.

19. Ibid.

20. Ibid.

21. Ibid.

22. Ibid.

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USAF Counterproliferation Center

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Barry R. Schneider, Director
USAF Counterproliferation Center
325 Chennault Circle
Maxwell AFB AL 36112-6427

Email: Barry.Schneider@maxwell.af.mil

Jo Ann Eddy, Associate Editor
The Counterproliferation Papers

Email: JoAnn.Eddy@maxwell.af.mil

(334) 953-7538 (DSN 493-7538)